EPA

REGION 3

FAX TRANSMISSION

HAZARDOUS SITE CLEANUP DIVISION (3HS00)
1650 Arch Street
Philadelphia, PA 19103-2029

Date 2/12/03
Number Page(s) 9 (incl. cover)

TO: Alicia Sholtz
FAX: 518-356-3793

FROM: Lorie Baker
FAX: (215) 814-3001
PHONE: (215) 814- 3355

COMMENTS: Fax from NPI owner

NEUTRON PRODUCTS, INC.

22301 Mt. Ephraim Road, P.O. Box 68
Dickerson, MD 20842
301-349-5001 *FAX:* 301-349-2433

FAX LEAD PAGE

COMPANY: US EPA

TO: CHRIS WAGNER

(Provide copy to: ________________ ***)***

Date/Time: [illegible] FAX Tele No: [illegible]
No. of Pages [illegible] (incl. Lead Pg.) NPI FAX Log No.: [illegible]

FROM: J. A. RANSOHOFF

SUBJECT / MESSAGE:

804 448 5404

If FAX is incomplete or illegible, please contact us at 301-349-5001

NEUTRON PRODUCTS inc
22301 Mt. Ephraim Road, P. O. Box 68
Dickerson, Maryland 20842 USA
301-349-5001 FAX: 301-349-2433
e-mail: neutronprod@erols.com

20 November 2002

via FAX (215) 814-3254

Ms. Chris Wagner
On-Scene Coordinator
Hazardous Site Cleanup Division
3HS31
1650 Arch St.
Philadelphia, PA 19103-2029

Dear Chris,

As we discussed by telephone last month, I am writing to transmit the ALARA analysis which we have prepared regarding the contaminated soil trapped in and around the abandoned rail siding which adjoins our facility. We would be interested in your critique, and would welcome some serious discussion.

Our submission of this analysis to you was delayed in order for us to learn more about the Memorandum of Understanding between NRC and EPA regarding, among other things, levels of soil contamination which would trigger NRC to request a consultation with EPA when NRC-licensed facilities are decommissioned. Although we are not directly regulated by NRC, as a practical matter we are regulated no less stringently by the State, and accordingly, the MOU is generally germane to our business, and specifically to the determination of an appropriate course of action in our current situation.

As you know, the levels of soil contamination trapped in the ballast along about 50 feet of the abandoned rail siding adjoining the southern boundary of our Dickerson plant site exceed both the MOU trigger level of 6 picoCuries per gram and the 8 picoCurie per gram limit that was imposed upon our 01 License by MDE and NRC in 1989. In fact, although that license limit has been responsible for nearly five thousand of the citations filed by the state in fabricating Neutron's record of alleged non-compliance referred to in your memo of September 27, 2002:

> there is no evidence that our inability to satisfy that requirement caused or credibly threatened harm to persons, property or environmental decency; and
>
> it is not credible that any member of the public has ever received as much as 3 millirem per year from that source (compared to about 300 from natural causes).

Moreover, throughout the period of our allegedly reckless non-compliance, no member of the public has ever been exposed to more than the 100 mrem/yr regulatory limit from all causes arising from Neutron's activities, and that number is now less than 50 mrem/yr for the most highly exposed individual. Yet, the flow of citations and MDE's false accusations that Neutron has "recklessly released radioactive material to the environment in an uncontrolled manner" are clearly designed to create "concerns" among the body politic (and apparently even among better informed persons such as you.)

While we cannot comment on the other MOU limits with the depth of data and experience that we have had as the result of melting about 8,500,000,000,000,000,000 picoCuries of cobalt-60, processing more 20,000,000,000,000,000,000 picoCuries of unclad cobalt-60, and managing the waste generated thereby, without credible adverse impact to persons or property, we find the MOU triggers for cobalt-60 contamination of soil to be excessively stringent by a wide margin, and surprisingly low compared to the MOU levels for some of the much more hazardous isotopes listed.

In any event, as you can see from our ALARA analysis, the MOU limits seem to be focused more on what can be measured with extraordinarily sensitive equipment than on what is reasonably required to protect the public health and safety, with a result that seems likely to mis-allocate priorities. If you think we have missed the point of all this, please advise. If not, we would like to discuss with NRC and EPA, and perhaps other interested parties, our thoughts for making better use of ALARA in both the adoption and enforcement of regulatory limits.

Summarizing in brief, we take note of the fact that the "trigger" limits have been surpassed by a substantial margin; and we came away from the NRC-EPA workshop conducted a few weeks ago with the impression that pulling the "trigger" does not execute the transgressing licensee, but rather initiates purposeful discussion and analysis among said licensee, NRC and EPA. In that spirit, we furnish the enclosed analysis; and in doing so, we respectfully request the initiation of serious discussions at the earliest possible time - and certainly before the issuance of your pending report.

In that regard, we have initiated other ALARA analyses, including one regarding the management of Neutron's RadWaste, which we trust you will evaluate and discuss with us before finalizing your report. Thank you for your interest, your comments, and your future cooperation.

Regards,

Neutron Products, Inc.

J. A. Ransohoff, President

ALARA Analysis Regarding Remediation and Shipment of Contaminated Soil Located Along the Rail Siding Adjacent to Neutron Products' Dickerson Plant

This ALARA analysis has been conducted on the off-site contaminated soil in the immediate vicinity of Neutron Products' Dickerson facility, based on the conditions at the facility and its environs during the summer of 2002. The only isotope of interest herein is cobalt-60.

I. Considerations

I.1 Locations of Off-Site Contamination

There are two basic types of off-site contamination arising from Neutron's operations:

a) One comprises discreet particles which have either been blown or carried off-site and which have occasionally been found during routine monthly surveys of surrounding properties. No sites of such contamination have been found off-site this year through the October survey of 2002. None were found in 2001 and two such sites were found in 2000. During the past 22 years, Neutron estimates that a few hundred such sites have been found and removed, none of which have represented a credible threat to public health and safety. When a site of activity is found, the property owner is notified and the contamination removed and returned to Neutron.

It is thought that most of the sites, including those found recently, were released several years ago, and that modifications to Neutron's facility and operations during the past two decades or so have greatly reduced the frequency of this type of release. However, Neutron's on-going operations (whether engaged in source fabrication or not) inherently entail some small release of cobalt-60 contamination and the continued release of some contamination in this manner cannot be completely precluded.

b) The second type of contamination is that carried from the courtyard or plant roof tops by stormwater run-off. The courtyard is a paved portion of the Limited Access Area which, although fenced, is otherwise open to the environment, and is located between Neutron's source fabrication plant and its RadWaste storage facilities. The contamination released by this mechanism and deposited downstream tends to be much more uniformly distributed than the discreet sites occasionally found on neighborhood properties.

After leaving the courtyard (or roof tops), stormwater run-off passes successively through a stone trap, a dry pond, a rip-rap outfall, and a grassy area within Neutron's fenceline. In each successive step, a significant percentage of the remaining contamination is removed. Analyses of removed soil and stone indicate that less than 2 millicuries per year enter Neutron's stormwater management system and that much more than 90% of such activity is removed thereby.

Finally, the run-off flows along and into an abandoned rail siding which is immediately adjacent to Neutron's property, and which serves to remove residual contamination. A

waist-height survey of the area shows that the contamination along the siding is readily detectable near the dry pond outfall, but is indistinguishable from background from other sources (including skyshine from the plant) within a few dozen yards downstream thereof.

Again, the levels of contamination at issue herein do not present a credible threat to public health, safety, or the quality of the environment.

I.2 Dose to Members of the Public

Regarding the discreet particles found off-site referred to in I.1(a), it is unlikely that such contamination would contribute materially to the annual exposure of any member of the public. Neutron's continuing program of off-site surveillance would be likely to detect any adverse trends in the off-site release of contamination by means of this vector, and it plans to continue its current program of conducting such surveys and removing and evaluating sites of contamination when found.

Regarding the contaminated soil on the rail siding and downstream thereof, the highest dose rate along the rail siding is generally approximately 40-50 μR/hr, whereas background in the area (including skyshine from the plant) is approximately 15 μR/hr. So, the contamination retained by the siding contributes a maximum of approximately 30 μR/hr within a relatively small area not likely to be occupied for any meaningful length of time by anyone.

In fact, the member of the public likely to spend the most time in the area is the person who cuts the grass adjacent to the rail siding. As a conservative estimate, assume this individual spends 20 hours per year in this area, and further assume that all of that time is spent in the location with the highest dose rate. The annual exposure from the contamination at issue herein would be:

$$(30\ \mu\text{rem/hr}) \times (20\ \text{hr}) = 600\ \mu\text{rem} = 0.6\ \text{mrem} = 0.0006\ \text{rem}$$

Furthermore, it is extremely unlikely that all members of the public combined would spend more than 50 person-hours in this area in any given year, so that the *collective* exposure to the entire Dickerson community from the contamination released is likely to be well below 0.002 person-rem/year.

I.3 Prospective Use of the Land at Issue

The land at issue is primarily an abandoned rail siding along the main line of the CSX. It is unlikely in the extreme that this land will ever have a residential use, or become a park, or have any other use which would encourage lengthy visits by members of the public.

I.4 Likely End Result of Complete Remediation

Although the release from Neutron's facility of contamination in stormwater run-off has been greatly reduced during the past 20 years, some contamination is still being released by this mechanism, and will continue to be so released whether Neutron is fabricating sources or not. Neutron's efforts to enclose the courtyard, which would effect a further decrease in the amount of material released, have been thwarted in a manner which is not likely to be reversed in the near future.

As an alternative, Neutron has focused on ways to reduce the release of contamination from the Limited Access Area, and on improving the on-site capture of whatever contamination is released. As a result of this program, the dose rate along the abandoned rail siding has been declining for more than a decade, a trend which Neutron does not anticipate reversing in any material way in the future. That said, because low levels of contamination will continue to be released (as explained above), even if the rail siding were completely remediated today, it is likely that it would become contaminated again - to some very low level - in the near future.

II. Cost-Benefit Analysis

II.1 Benefits

The only prospective benefit to be derived from the remediation of the abandoned rail siding and the areas downstream thereof would be the reduction of the collective public exposure by a maximum of 0.002 person-rem/year. Using the NRC's NUREG 1530 (which places the value of a person-rem of exposure at $2,000), the economic value of such dose reduction would be about $4 per annum.

Including the estimated occupational exposure of Neutron's personnel from the contamination in the dry pond, the abandoned rail siding, etc. would increase the collective annual exposure to all individuals to a maximum of 0.010 person-rem/year. Thus, the complete remediation of the area could reduce all exposures by a maximum of 0.010 person-rem/year, thereby justifying the expenditure of $20 per year.

II.2 Costs

There are several costs to consider, including the expenditure of human and material resources, the hazards associated with shipping the soil that is removed, the hazards associated with performing the work itself (including the operation of heavy equipment and the transportation of equipment to and from the work site), occupational exposure, etc.

It is ironic, for example, that the occupational exposure involved in performing the remediation

(although truly trivial) would likely be more than that now received by all members of the public in toto from the contamination. However, for the purposes of this analysis, that occupational exposure will not be considered because it is so small as to not contribute materially to the prospective costs.

We estimate that, in order to remediate the abandoned siding and the areas downstream thereof to a soil concentration of less than 8 pCi/g, on the order of 1,000 cu.ft. of material would have to be removed. We estimate that our expenses would be as follows:

Manpower	$ 8,000
Equipment rental	$ 500
Cost of B-25's	$ 6,000
Shipping	$ 5,000
Disposal	$20,000 - $100,000[1]
TOTAL	**$39,500 - $119,500**

In addition, MDE and NRC regulations require that remediation decisions be made only after considering all factors including "detriments such as traffic accidents expected to potentially result from decontamination and waste disposal". In this case, the disposal would likely involve two roundtrip tractor trailer shipments between Dickerson, MD and Clive, Utah - a total distance of approximately 8,000 miles.

Statistics provided by the U.S. Department of Transportation show that for every 100 million miles of tractor trailer shipments, the DOT expects to record approximately 200 accidents, 17 injuries and 0.4 fatalities. So, for a distance of 8,000 miles, the DOT would expect to record 2×10^{-2} accidents, 1×10^{-3} injuries, and 3×10^{-5} fatalities.

In addition, other potential risks to be considered include:

the risks of traffic accidents associated with transporting the empty B-25's to the job site entailing hundreds of additional tractor trailer miles;

the risks of traffic accidents associated with transporting the equipment to and from the job site; and,

the risks associated with using the heavy equipment on the job site.

---

1 Some material may be acceptable for the bulk release program in the State of Tennessee, which explains the wide range of these estimates.

For the purposes of this evaluation, because the costs clearly outweigh the benefits, these additional risks will not be quantified as additional costs.

II.3 Analysis

Setting aside for a moment the monetary aspects of the cost-benefit analysis, consider the comparative risks posed by the soil, if it is left in place, and if it is shipped to Utah.

Using even the deliberately overstated assumptions set forth by the linear no-threshold model (LNT) which claim that 4×10^{-4} additional cancer deaths will result from each collective person-rem of exposure, it is clear that, even if the soil contamination at issue were to contribute as much as 2 mrem/year of collective exposure to the public over the ensuing 5 years, the increased risk would result in 4×10^{-6} fatalities. In the preceding section, we determined that shipping the soil would result in 3×10^{-5} additional fatalities, so that the act of shipping the contaminated soil to Utah would be 7.5 times more likely to cause a fatality than simply leaving the soil in place.

Examining the monetary aspects of the cost-benefit analysis, it is clear that the anticipated expense of approximately $50,000 overwhelms the maximum possible benefit of $20 per year. Thus, we conclude that it is not ***reasonable*** to spend $50,000 of real money to achieve a prospective $20 per year benefit. Moreover, the expenditure of resources for such a purpose would deny Neutron the use of those funds to address matters of much more substance. Clearly, Neutron could use that $50,000 to produce a much more substantial benefit. We submit that ALARA is intended to provide priority-setting guidance to regulators and licensees alike, and this analysis clearly demonstrates that the remediation of the abandoned rail siding, and the disposal of the contaminated soil therefrom, warrants a very low priority for the foreseeable future.

EPA/MDE Meeting on Neutron Products, Inc.
November 15, 2002

I. EPA Activities to Date

A. Regulatory history provided by MDE
B. Sampling assessment 8/02
C. ATSDR Recommendation
D. Meetings with Mr. Rasanhoff
E. Meeting with members of Dickerson Community Group
F. Letter to Senator Sarbanes RE: C. Oberdorfer letter
G. NPL Status

II. Additional Information Needed for Removal Assessment

A. Information from facility
1. Decommissioning plan
2. NPI's response to create a decommissioning plan in absence of the 01 activities
3. Inquiry to explanation for particles greater than 8 pc/g outside property
4. Past and present actions regarding RR siding

B. PRP Search

III. EPA's Future Plans

A. Collect information above through CERCLA 104(e) authority Send letter to both Rasanhoff + RSO

B. Enter into IAG with DOE to provide technical guidance for removal response actions, not inconsistent with decommissioning in the event conditions at the Site should change. These conditions would include recommendations on security and stabilization for immediate action. These actions will be coordinated with MDE.

C. Pursue action regarding contamination of railroad siding with NPI and CSX.

D. Obtain current information on the Site including geo-referenced overflights and site surveys.

E. PRP Search

F. Prepare counter-terrorism contingency plan in conjunction with MDE and Montgomery County.

FIGURES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

October 25, 2002

Mr. Alan Jacobson
Maryland Dept. of the Environment
Air & Radiation Division
1800 Washington Blvd. #105
Baltimore, MD 21230-1721

RE: Neutron Products Data Package

Dear Mr. Jacobson:

Enclosed please find a copy of the data received regarding the EPA removal sampling assessment which was performed at the Neutron Products facility in August of this year. EPA is reviewing this data and will incorporate it into a report I am preparing on the removal assessment. I just received this data and wanted to send it to you immediately.

I would also like to set up a meeting with MDE and EPA regarding this data and future actions at the Site. I am available to meet with you at your office.

Also, I would like to thank you for lending me your Site photo. I will hand-deliver it to your office next week.

Thank you for all the assistance you have provided to EPA. I will contact you next week to set up a mutually convenient meeting time.

Sincerely,

Christine Wagner

Christine Wagner, OSC
Removal Response Section

Enclosure

Neutron Products- Results of Soils and Waters from 8/02

Location	pCi/g of Co-60
Fence Inside LAA	297 +- 17
Outside LAA fence line	14.6 +- .83
Under air conditioner	18.6 +- 1.1
Stainless pipe outside LAA	20.9 +- 1.2
Roof Drain W of LAA	14.5 +- .82
Roof Drain W of LAA	14.6 +- .83
Soil under power panel	8.47 +- .48
Stone gravel trap inlet	26.9 +- 1.5
Power pole near dry pond	71.6 +- 4.1
Dry pond west edge of channel	368 +- 21
Dry pond hot particle	35.3 +- 2
RR old siding	11.6 +- .66
8 ft from back fence	ND
1 meter west of NP #12	41 +- 2.3
South power pole- west property line	53.9 +- 3.1
Fence line SW corner	33.7 +- 1.9
Fence line SW corner	34.9 +- 2
5 ft W of fence	11.7 +- .67
RR siding 2 ½ posts E of SW corner	116 +- 6.6
5 Ft E of stop sign	16.9 +- .96
White house lawn	32.7 +- 1.9
Dickerson Conservation Park	ND
Fire Station Bealsville	ND
Culvert Outfall	.15 +- .012
Culvert outfall	.16 +- .015
Culvert inlet	6.6 +- .38
Monocacy Creek sediment	ND
Little Monocacy Creek (water)	ND
Little Monocacy Creek (water)	ND

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Ed Sensintaffar

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 20, 2002

MEMORANDUM

SUBJECT: Radiochemical results for
Neutron Products Samples

FROM: John Griggs, Chief
MASB

To: Sam Poppell, Project Officer
NAREL

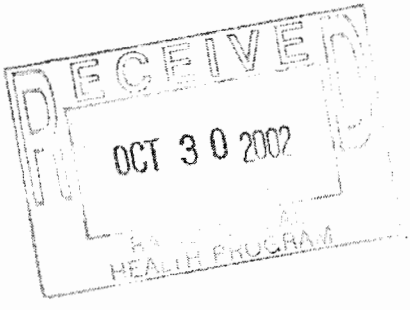
Attached are the results of gross alpha and beta analysis on samples collected from Neutron Products in Dickerson, MD. The samples constitute NAREL batch numbers 0200036 through 0200039.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

cases, the gross alpha results were statistically elevated over the expected gross alpha concentrations. The samples where this was the case were NP #5, NP#7, NP#9, and NP#14 (A2. 03825, A2.03827, A2.03829, and A2.03834, respectively). Due to the large variability associated with gross alpha measurement, I requested that three additional aliquots be analyzed from each of these samples to obtain a better statistical representation of these samples. The results of the repeated gross analyses indicate that two samples (A2.03825 and A2.03829) remain with unexplained elevated alpha activity. If necessary, more extensive analyses may be performed to determine if an abnormality exists.

cc: Ed Sensintaffar, Director, NAREL
John Griggs, Chief, MASB
James Moore, Chief, ESB
Dave Kappleman, ESB



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 30, 2002

MEMORANDUM

SUBJECT: Evaluation of Neutron Products Radioanalytical Results

FROM: J. Scott Telofski, PE,
Environmental Studies Branch

TO: Sam Poppell,
Environmental Studies Branch

I have reviewed the gamma spectrometry and gross alpha and gross beta results for samples taken at Neutron Products that were analyzed here at the National Air and Radiation Environmental Laboratory. I have noted a few abnormalities that I will discuss in further detail in the following paragraphs.

Cobalt-60 is detected in essentially every sample at this site, but is not detected in background samples. I understand the history of this site indicates that this is not unexpected. There is one sample (NP #12, A2.03832, where cobalt-60 was not detected. However, the results for that sample are extremely abnormal for other naturally occurring radionuclides, and I asked that the sample be recounted. The recount showed positive cobalt-60, as well as normal levels of naturally occurring nuclides.

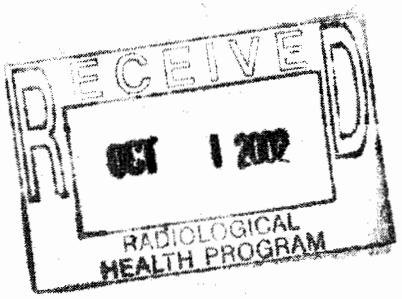
Two samples showed detectable cesium-137 (NP #1 and NP #8, A2.03821 and A2.03828, respectively). I believe this was an unexpected anomaly, and thus requested the gamma spectrometry be performed a second time on these samples to confirm the cesium-137 concentrations. As part of the request, the second analysis was performed using different detectors to attempt to minimize the possibility that the cesium-137 was not erroneously identified from a single escape peak of the cobalt-60 1173 keV gamma. The results of the reanalyses appear to confirm the cesium-137 concentrations initially measured. I requested a third analysis be performed to further verify the cesium-137 results, which did in fact reconfirm the presence of the cesium-137.

Since there were detections of unexpected radionuclides, I also performed a mathematical determination of the gross alpha and gross beta results to expected gross alpha and gross beta concentrations based on the presence of gamma emitters detected by gamma spectrometry. In four

NEUTRON PRODUCTS Inc
22301 Mt. Ephraim Road, P. O. Box 68
Dickerson, Maryland 20842 USA
301-349-5001 FAX: 301-349-2433
e-mail: neutronprod@erols.com

30 September 2002

Mr. Roland G. Fletcher
Radiological Health Program
Maryland Department of the Environment
2500 Broening Highway
Baltimore, MD 21224



Re: MD-31-025-01

Dear Mr. Fletcher,

I am writing to certify that Jeffrey Williams conducted the random inspection for the month of August on 28 August. In addition, I have enclosed Bob Alexander's report for the month of August.

In order to fulfill our reporting requirements under License Condition 15C, in the month of August there were no HECM readings exceeding 22,000 dpm.

Routine soil samples for August were taken on 28 August and counted on the multi-channel analyzer on 30 August. The area of highest contamination was in the dry pond. None of the random samples taken from elsewhere around the property exhibited contamination levels exceeding the 8 pCi/g license limit. All levels of contamination found were consistent with those found on previous occasions, and do not represent a radiological hazard. The records are available for your review, with all soil activity levels recorded in the units of pCi/g.

As you know, EPA and ATSDR were on-site on August 14 and 15, and we accompanied them during the on-site portion of their visit. We were provided with split samples of the soil samples taken and participated in additional surveys. As far as we know, the only contamination found by EPA outside of the areas previously known to be contaminated was a small spot in front of the white house, which was removed and added to the contaminated soil stored in the LAA.

In keeping with our program of focusing our remediation efforts on the areas with the highest levels of contamination, we continued our remediation of the dry pond and stone trap, including the removal of the clinoptilolite from the dry pond outfall baskets (and the subsequent installation of filter media) on August 9, and removal of spots of elevated contamination in the dry pond based on the survey of August 29 (as explained below). All of the contaminated soil and

clinoptilolite removed is now stored in the LAA.

The routine environmental survey performed on a section of our property every month revealed no spots of cobalt-60 contamination. The survey for August was conducted on 27 August and focused on the north-east area of our property. The records are available for your review. Additional on-site surveys were conducted in the dry pond itself in response to the higher-than-expected spot of contamination found by Mr. Nelson in the dry pond during the EPA visit. Our survey yielded 5 additional spots with somewhat elevated levels of contamination. These were removed and are now stored in the LAA with the other contaminated soil.

The off-site survey for August was conducted on 29 August on a portion of the rental property next door to Neutron's facility as a follow-up to the survey conducted by EPA, during which we noted some areas of potential contamination which we believed warranted further study. However, our additional survey did not reveal any contamination. Survey records are available for your review.

If this report is inadequate in any way, or if you need additional information, please let me know.

Sincerely,

Neutron Products, inc.

W.L. Ransohoff
Assistant to the RSO

HP CONSULTANT REPORT FOR AUGUST 2002

Introduction

I performed a regularly scheduled audit of radiation protection conditions within the LAA on August 28, 2002. Since no operations involving licensed activities or significant occupational exposures were performed during August the focus of the audit was on conditions that should be of interest at a currently shutdown facility.

1.0 Performing Unauthorized Work

I saw nothing to indicate that currently unauthorized work had been performed during August or before.

2.0 R/A Material Storage and Identification

The identification of radioactive materials (and containers) located inside the facility, including the interior of the LAA, was found to be improving. In fact, more attention than ever is being given to the identification of such containers to prevent inadvertent disposal along with routine dry refuse. I believe the container-identification effort was handled more efficiently at Neutron Products when it was easier, using commercially available tags and tape. [I remember, when I was technician, how "tagging" seemed to be almost an unnecessary nuisance when I was working as fast as I could to get a task done on time.] Since the early 1950's yellow tags have been commercially available with strings, the radiation symbol and prescribed wording in magenta, and labeled blanks for specific data that had to be written in by the technician. Back then they faded in sunlight and rain, but now I believe they are much improved and last longer.

In the LAA courtyard, despite considerable staff effort to overcome the difficulty, longstanding weathering problems continue to interfere with the long-term identification of storage containers using attached tags and labels. Sunlight eventually causes fading to the point of obscurity, and rainwater hastens this effect. The necessary identification information has been painted on the walls of most of the large containers of slightly contaminated soil, defeating the weathering problem. This solution could be employed also for the smaller containers, since all painting can be performed easily, using spray cans, with or without templates.

3.0 Access Control Maintained

All access controls to the LAA, including the courtyard, continue to be in place and

functioning without interruption or detrimental modification. Control of access to the property has been enhanced by the installation of additional fencing and vehicle/personnel gates with locks controlled remotely by personnel located within the facility.

4.0 Routine Surveys Continued

Comprehensive radiation and contamination surveys have for many years been conducted at Neutron Products, including the LAA, the facility within company boundaries, and in the environment beyond those boundaries. I found that these surveys were continued without interruption or modification during August.

5.0 Warning Signs Posted

I noticed that since my previous audit a considerable effort had been made to update the posting of radiation warning signs. Several signs had been replaced with new ones, and care had been taken to assure that the wording and, where appropriate, posted dose rates of each sign were consistent with actual conditions as well as applicable regulations.

6.0 Barriers Maintained

Areas of the LAA for the most part have physical barriers consisting of walls with doors and locks. Exceptions are (1) the main pool and south canal, which are kept separate from the handling area in front of the cell by a metallic-frame "fence" and (2) temporary rope barriers used when necessary in the courtyard to designate High Radiation Areas. I found the pool/canal barrier in place. No barriers were in place (or necessary) in the courtyard. Courtyard spaces in which the dose rate exceeded 100 mR/h were limited to a few isolated locations just outside the locked north and south waste storage room doors. In each case the rate fell below 100 only a few inches from the door; no person was likely to receive a whole-body dose exceeding 100 mrems.

7.0 Personal Dosimetry

Within the LAA the minimum personal dosimetry requirements are applicable to everyone who enters, and a log of entries and SRD results is maintained at the entrance. Although licensed activities involving work with teletherapy sources or other radioactive sources was not performed during August, the personal dosimetry requirements had not been relaxed or modified.

8.0 Alarm System Operability

The alarm systems installed in the LAA are operating properly. The systems are tested quarterly for operability, and 3rd-quarter testing had been completed at the time of my audit.

9.0 Health Physics Staffing

There has been no reduction (or changes of any kind) in health physics staffing. Jeff Williams is still serving as the RSO, and Danny Wineholt is still working full-time as the health physics technician. Jeff Corun continues as the full-time LAA supervisor. The other two LAA workers, Dick Demory and Matt Repp, are still assigned to the LAA but may be available temporarily for tasks in other areas as necessary. I still perform the health physics consultant duties (monthly audits, quarterly training, on call assistance and special assignments from the RSO).

10.0 Housekeeping

Since I began visiting Neutron Products in 1989 I have always been favorably impressed with housekeeping conditions throughout the

facility in general and within the LAA in particular. My experience in industry, experience as an inspector while working for NASA, and observations while visiting nuclear facilities as a consultant have taught me that acceptable housekeeping conditions are almost always accompanied by acceptable health physics conditions, and I find that still to be the case in the LAA and elsewhere at Neutron Products.

L. Baker

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 30, 2002

MEMORANDUM

SUBJECT: Evaluation of Neutron Products Radioanalytical Results

FROM: J. Scott Telofski, PE,
Environmental Studies Branch

TO: Sam Poppell,
Environmental Studies Branch

I have reviewed the gamma spectrometry and gross alpha and gross beta results for samples taken at Neutron Products that were analyzed here at the National Air and Radiation Environmental Laboratory. I have noted a few abnormalities that I will discuss in further detail in the following paragraphs.

Cobalt-60 is detected in essentially every sample at this site, but is not detected in background samples. I understand the history of this site indicates that this is not unexpected. There is one sample (NP #12, A2.03832, where cobalt-60 was not detected. However, the results for that sample are extremely abnormal for other naturally occurring radionuclides, and I asked that the sample be recounted. The recount showed positive cobalt-60, as well as normal levels of naturally occurring nuclides.

Two samples showed detectable cesium-137 (NP #1 and NP #8, A2.03821 and A2.03828, respectively). I believe this was an unexpected anomaly, and thus requested the gamma spectrometry be performed a second time on these samples to confirm the cesium-137 concentrations. As part of the request, the second analysis was performed using different detectors to attempt to minimize the possibility that the cesium-137 was not erroneously identified from a single escape peak of the cobalt-60 1173 keV gamma. The results of the reanalyses appear to confirm the cesium-137 concentrations initially measured. I requested a third analysis be performed to further verify the cesium-137 results, which did in fact reconfirm the presence of the cesium-137.

Since there were detections of unexpected radionuclides, I also performed a mathematical determination of the gross alpha and gross beta results to expected gross alpha and gross beta concentrations based on the presence of gamma emitters detected by gamma spectrometry. In four

cases, the gross alpha results were statistically elevated over the expected gross alpha concentrations. The samples where this was the case were NP #5, NP#7, NP#9, and NP#14 (A2. 03825, A2.03827, A2.03829, and A2.03834, respectively). Due to the large variability associated with gross alpha measurement, I requested that three additional aliquots be analyzed from each of these samples to obtain a better statistical representation of these samples. The results of the repeated gross analyses indicate that two samples (A2.03825 and A2.03829) remain with unexplained elevated alpha activity. If necessary, more extensive analyses may be performed to determine if an abnormality exists.

cc: Ed Sensintaffar, Director, NAREL
John Griggs, Chief, MASB
James Moore, Chief, ESB
Dave Kappleman, ESB

L. Baker

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 20, 2002

MEMORANDUM

SUBJECT: Radiochemical results for
Neutron Products Samples

FROM: John Griggs, Chief
MASB

To: Sam Poppell, Project Officer
NAREL

Attached are the results of gross alpha and beta analysis on samples collected from Neutron Products in Dickerson, MD. The samples constitute NAREL batch numbers 0200036 through 0200039.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Ed Sensintaffar

L. Baker

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 12, 2002

MEMORANDUM

SUBJECT: Radiochemical results for
Neutron Products Samples

FROM: for John Griggs, Chief Tonya B. Hudson
MASB

To: Sam Poppell, Project Officer
NAREL

Attached are the results of gamma analysis on samples collected from Neutron Products in Dickerson, MD. The samples constitute NAREL batch numbers 0200036 through 0200039. Results of further analyses will be sent as they are completed.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Ed Sensintaffar

L. Baker

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0200039

Project: NEUTRON PRODUCTS
Analysis Procedure: Gross Alpha and Beta on Water Samples
Date Reported: 09/12/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.03843Q	BKG 02	SAM	WATER	08/14/2002	08/19/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

For James D. Moore 9/20/02

Mary F. Wisdom — Date
Quality Assurance Coordinator

John Griggs 9/20/02

John Griggs, Ph.D. — Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity in water samples has the potential for greater analytical bias. It should be noted that this potential analytical uncertainty is not included in the two-sigma counting uncertainty term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

ANALYSIS SUMMARY

Analysis Procedure: NAREL GR-01
Title: Gross Alpha and Beta on Water Samples

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.03843Q		N/A	09/03/2002	0007072Y	0002563G
A2.03843Q	DUP	N/A	09/03/2002	0007072Y	0002563G

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

SAMPLE ANALYSIS REPORT

Sample #:	A2.03843Q	QC batch #:	0002563G
Matrix:	WATER	Prep batch #:	0007072Y
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e+02 ML	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: LITTLE MONOCACY CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 13:43	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	-4.51e-01	1.1e+00	1.5e+00	PCI/L	09/03/2002
Beta	2.07e+00	8.4e-01	1.2e+00	PCI/L	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

SAMPLE ANALYSIS REPORT

Sample #:	A2.03843Q	QC batch #:	0002563G
Matrix:	WATER	Prep batch #:	0007072Y
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e+02 ML	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	DUP

Comment: LITTLE MONOCACY CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 13:43	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	-4.13e-01	1.1e+00	1.5e+00	PCI/L	09/03/2002
Beta	3.01e+00	8.1e-01	1.0e+00	PCI/L	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

QC BATCH SUMMARY

QC batch #: 0002563G
Preparation procedure: N/A
Analysis procedure: NAREL GR-01

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
A2.03843Q		N/A		EFG
A2.03843Q	DUP	N/A		EFG

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0002563G Analytical Procedure: NAREL GR-01

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
A2.03843Q	ALPHA	-4.51e-01 ± 1.1e+00	-4.13e-01 ± 1.1e+00	0.00	0.05 OK
A2.03843Q	BETA	2.07e+00 ± 8.4e-01	3.01e+00 ± 8.1e-01	36.97	1.54 OK

Analyst: Eunice F. Gatlin 9/11/02
Gatlin, Eunice F.

QA Officer: Kirk D McElroy 9/12/02

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0200036

Project: NEUTRON PRODUCTS
Analysis Procedure: Gross Alpha and Beta on Solid Samples
Date Reported: 09/12/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.03821J	NP #1	SAM	SOIL	08/14/2002	08/19/2002
A2.03822K	NP #2	SAM	SOIL	08/14/2002	08/19/2002
A2.03823L	NP #3	SAM	SOIL	08/14/2002	08/19/2002
A2.03824M	NP #4	SAM	SOIL	08/14/2002	08/19/2002
A2.03825N	NP #5	SAM	SOIL	08/14/2002	08/19/2002
A2.03826P	NP #6	SAM	SOIL	08/14/2002	08/19/2002
A2.03827Q	NP #7	SAM	SOIL	08/14/2002	08/19/2002
A2.03828R	NP #8	SAM	SOIL	08/14/2002	08/19/2002
A2.03829T	NP #9	SAM	SOIL	08/14/2002	08/19/2002
A2.03830K	NP #10	SAM	SOIL	08/14/2002	08/19/2002
A2.03831L	NP #11	SAM	SOIL	08/14/2002	08/19/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

for James B. Moore 9/20/02

Mary F. Wisdom — Date
Quality Assurance Coordinator

John Griggs 9/20/02

John Griggs, Ph.D. — Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity has the potential for greater analytical bias. This is especially true for solid samples. It should be noted that this potential analytical uncertainty is not included in the two-sigma counting uncertainty term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

ANALYSIS SUMMARY

Analysis Procedure: NAREL GR-03
Title: Gross Alpha and Beta on Solid Samples

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.03821J		N/A	09/03/2002	0007075B	0002566K
A2.03822K		N/A	09/03/2002	0007075B	0002566K
A2.03823L		N/A	09/03/2002	0007075B	0002566K
A2.03824M		N/A	09/03/2002	0007075B	0002566K
A2.03825N		N/A	09/03/2002	0007075B	0002566K
A2.03825N	DUP	N/A	09/03/2002	0007075B	0002566K
A2.03826P		N/A	09/03/2002	0007075B	0002566K
A2.03827Q		N/A	09/03/2002	0007075B	0002566K
A2.03828R		N/A	09/03/2002	0007075B	0002566K
A2.03829T		N/A	09/03/2002	0007075B	0002566K
A2.03830K *		N/A	09/03/2002	0007075B	0002566K
A2.03831L		N/A	09/03/2002	0007075B	0002566K

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03821J	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	94.75 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: FENCE INSIDE LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.68e+00	1.1e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	1.83e+02	1.1e+01	7.1e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03822K	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	88.30 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: OUTSIDE LAA - FENCE LINE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.69e+00	1.2e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	2.93e+01	5.5e+00	6.3e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03823L	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	74.68 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: UNDER AIR CONDITIONER

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	4.14e+00	1.1e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	3.88e+01	6.2e+00	6.8e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03824M	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	73.95 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: STAINLESS PIPE OUTSIDE LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.08e+00	9.5e+00	5.8e+00	PCI/GDRY	09/03/2002
Beta	1.85e+01	5.0e+00	6.4e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03825N	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	85.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: ROOF DRAIN W OF LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.81e+01	1.5e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	4.73e+01	6.7e+00	7.3e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03825N	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	85.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	DUP

Comment: ROOF DRAIN W OF LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.73e+01	1.4e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	5.78e+01	6.8e+00	6.5e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03826P	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	87.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: SOIL UNDER POWER PANEL

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.00e+00	1.1e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	2.31e+01	5.5e+00	6.8e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03827Q	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	71.92 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: STONE GRAVEL TRAP INLET

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.93e+01	1.1e+01	6.1e+00	PCI/GDRY	09/03/2002
Beta	3.16e+01	5.8e+00	6.7e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03828R	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	75.17 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: POWER POLE NEAR DRY POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	6.75e+00	1.2e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	4.72e+01	6.7e+00	7.1e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03829T	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	81.51 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

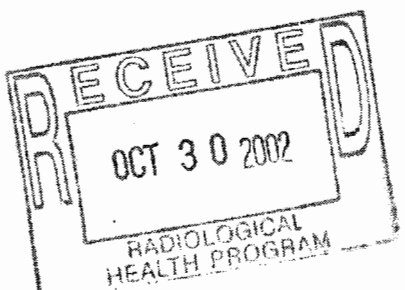
Comment: DRY POND - WEST EDGE OF CHANNEL

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.27e+01	1.4e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	1.79e+02	1.1e+01	6.5e+00	PCI/GDRY	09/03/2002



U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03830K	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	87.07 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: DRY POND - HOT PARTICLE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.74e+01	1.3e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	3.61e+01	6.2e+00	7.0e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03831L	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	89.43 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: RAILROAD - OLD SIDING

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.04e+01	1.0e+01	6.1e+00	PCI/GDRY	09/03/2002
Beta	2.02e+01	5.2e+00	6.5e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

QC BATCH SUMMARY

QC batch #: 0002566K
Preparation procedure: N/A
Analysis procedure: NAREL GR-03

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
A2.03821J		N/A		EFG
A2.03822K		N/A		EFG
A2.03823L		N/A		EFG
A2.03824M		N/A		EFG
A2.03825N		N/A		EFG
A2.03825N	DUP	N/A		EFG
A2.03826P		N/A		EFG
A2.03827Q		N/A		EFG
A2.03828R		N/A		EFG
A2.03829T		N/A		EFG
A2.03830K		N/A		EFG
A2.03831L		N/A		EFG

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0002566K Analytical Procedure: NAREL GR-03

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
A2.03825N	ALPHA	2.81e+01 ± 1.5e+01	2.73e+01 ± 1.4e+01	3.22	-0.09 OK
A2.03825N	BETA	4.73e+01 ± 6.7e+00	5.78e+01 ± 6.8e+00	20.05	1.74 OK

Analyst: Eunice F. Gatlin 9/11/02
Gatlin, Eunice F.

QA Officer: Kurt O McElvaine 9/12/02

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

September 12, 2002

MEMORANDUM

SUBJECT: Radiochemical results for
Neutron Products Samples

FROM: for John Griggs, Chief Jimya B. Hudson
MASB

To: Sam Poppell, Project Officer
NAREL

Attached are the results of gamma analysis on samples collected from Neutron Products in Dickerson, MD. The samples constitute NAREL batch numbers 0200036 through 0200039. Results of further analyses will be sent as they are completed.

Radiochemical analyses usually require the subtraction of an instrument background measurement from a gross sample measurement. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical significance, as for example in the evaluation of trends or the comparison of two groups of samples.

For all analyses except gamma spectroscopy, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the 2-sigma measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The activity, uncertainty, and MDC are given in the same units. The activity and 2-sigma uncertainty for a radionuclide measured by gamma spectroscopy are reported only if the nuclide is detected; so, the results of gamma analyses are never zero or negative. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226, and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected," or "ND," and provides a sample-specific estimate of the MDC.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-3450.

Attachments

cc: Ed Sensintaffar

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0200039

Project: NEUTRON PRODUCTS
Analysis Procedure: Gross Alpha and Beta on Water Samples
Date Reported: 09/12/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.03843Q	BKG 02	SAM	WATER	08/14/2002	08/19/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

For James B. Moore 9/20/02

Mary F. Wisdom — Date
Quality Assurance Coordinator

John Griggs 9/20/02

John Griggs, Ph.D. — Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity in water samples has the potential for greater analytical bias. It should be noted that this potential analytical uncertainty is not included in the two-sigma counting uncertainty term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

ANALYSIS SUMMARY

Analysis Procedure: NAREL GR-01
Title: Gross Alpha and Beta on Water Samples

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.03843Q		N/A	09/03/2002	0007072Y	0002563G
A2.03843Q	DUP	N/A	09/03/2002	0007072Y	0002563G

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

SAMPLE ANALYSIS REPORT

Sample #:	A2.03843Q	QC batch #:	0002563G
Matrix:	WATER	Prep batch #:	0007072Y
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e+02 ML	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: LITTLE MONOCACY CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 13:43	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	-4.51e-01	1.1e+00	1.5e+00	PCI/L	09/03/2002
Beta	2.07e+00	8.4e-01	1.2e+00	PCI/L	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

SAMPLE ANALYSIS REPORT

Sample #:	A2.03843Q	QC batch #:	0002563G
Matrix:	WATER	Prep batch #:	0007072Y
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.000e+02 ML	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	DUP

Comment: LITTLE MONOCACY CREEK

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 13:43	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	-4.13e-01	1.1e+00	1.5e+00	PCI/L	09/03/2002
Beta	3.01e+00	8.1e-01	1.0e+00	PCI/L	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200039

QC BATCH SUMMARY

QC batch #: 0002563G
Preparation procedure: N/A
Analysis procedure: NAREL GR-01

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
A2.03843Q		N/A		EFG
A2.03843Q	DUP	N/A		EFG

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0002563G Analytical Procedure: NAREL GR-01

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
A2.03843Q	ALPHA	-4.51e-01 ± 1.1e+00	-4.13e-01 ± 1.1e+00	0.00	0.05 OK
A2.03843Q	BETA	2.07e+00 ± 8.4e-01	3.01e+00 ± 8.1e-01	36.97	1.54 OK

Analyst: Eunice F. Gatlin 9/11/02
Gatlin, Eunice F.

QA Officer: Kirk D. McEwen 9/12/02

L. Baker

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #0200036

Project: NEUTRON PRODUCTS
Analysis Procedure: Gross Alpha and Beta on Solid Samples
Date Reported: 09/12/2002

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
A2.03821J	NP #1	SAM	SOIL	08/14/2002	08/19/2002
A2.03822K	NP #2	SAM	SOIL	08/14/2002	08/19/2002
A2.03823L	NP #3	SAM	SOIL	08/14/2002	08/19/2002
A2.03824M	NP #4	SAM	SOIL	08/14/2002	08/19/2002
A2.03825N	NP #5	SAM	SOIL	08/14/2002	08/19/2002
A2.03826P	NP #6	SAM	SOIL	08/14/2002	08/19/2002
A2.03827Q	NP #7	SAM	SOIL	08/14/2002	08/19/2002
A2.03828R	NP #8	SAM	SOIL	08/14/2002	08/19/2002
A2.03829T	NP #9	SAM	SOIL	08/14/2002	08/19/2002
A2.03830K	NP #10	SAM	SOIL	08/14/2002	08/19/2002
A2.03831L	NP #11	SAM	SOIL	08/14/2002	08/19/2002

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Chief of the Monitoring and Analytical Services Branch and the NAREL Quality Assurance Coordinator, or their designees, as verified by the following signatures.

for Dana B. Moon 9/20/02

Mary F. Wisdom — Date
Quality Assurance Coordinator

John Griggs 9/20/02

John Griggs, Ph.D. — Date
Chief, Monitoring and Analytical Services Branch

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Reagent blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A reagent blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "*Z* scores." A *Z* score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The *Z* score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The *Z* score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the *Z* score is computed.

Each standard uncertainty used to compute a *Z* score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity has the potential for greater analytical bias. This is especially true for solid samples. It should be noted that this potential analytical uncertainty is not included in the two-sigma counting uncertainty term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

ANALYSIS SUMMARY

Analysis Procedure: NAREL GR-03
Title: Gross Alpha and Beta on Solid Samples

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Prep Batch #	QC Batch #
A2.03821J		N/A	09/03/2002	0007075B	0002566K
A2.03822K		N/A	09/03/2002	0007075B	0002566K
A2.03823L		N/A	09/03/2002	0007075B	0002566K
A2.03824M		N/A	09/03/2002	0007075B	0002566K
A2.03825N		N/A	09/03/2002	0007075B	0002566K
A2.03825N	DUP	N/A	09/03/2002	0007075B	0002566K
A2.03826P		N/A	09/03/2002	0007075B	0002566K
A2.03827Q		N/A	09/03/2002	0007075B	0002566K
A2.03828R		N/A	09/03/2002	0007075B	0002566K
A2.03829T		N/A	09/03/2002	0007075B	0002566K
A2.03830K		N/A	09/03/2002	0007075B	0002566K
A2.03831L		N/A	09/03/2002	0007075B	0002566K

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03821J	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	94.75 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: FENCE INSIDE LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.68e+00	1.1e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	1.83e+02	1.1e+01	7.1e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03822K	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	88.30 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: OUTSIDE LAA - FENCE LINE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.69e+00	1.2e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	2.93e+01	5.5e+00	6.3e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03823L	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	74.68 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: UNDER AIR CONDITIONER

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	4.14e+00	1.1e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	3.88e+01	6.2e+00	6.8e+00	PCI/GDRY	09/03/2002

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03824M	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	73.95 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: STAINLESS PIPE OUTSIDE LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 16:44	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.08e+00	9.5e+00	5.8e+00	PCI/GDRY	09/03/2002
Beta	1.85e+01	5.0e+00	6.4e+00	PCI/GDRY	09/03/2002

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ALPBET ANALYSES
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SAMPLE ANALYSIS REPORT

Sample #:	A2.03825N	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	85.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: ROOF DRAIN W OF LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.81e+01	1.5e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	4.73e+01	6.7e+00	7.3e+00	PCI/GDRY	09/03/2002

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SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03825N	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	85.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	DUP

Comment: ROOF DRAIN W OF LAA

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.73e+01	1.4e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	5.78e+01	6.8e+00	6.5e+00	PCI/GDRY	09/03/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03826P	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	87.21 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: SOIL UNDER POWER PANEL

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	9.00e+00	1.1e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	2.31e+01	5.5e+00	6.8e+00	PCI/GDRY	09/03/2002

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ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03827Q	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	71.92 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: STONE GRAVEL TRAP INLET

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 18:24	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.93e+01	1.1e+01	6.1e+00	PCI/GDRY	09/03/2002
Beta	3.16e+01	5.8e+00	6.7e+00	PCI/GDRY	09/03/2002

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SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03828R	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	75.17 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: POWER POLE NEAR DRY POND

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54A	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	6.75e+00	1.2e+01	1.4e+01	PCI/GDRY	09/03/2002
Beta	4.72e+01	6.7e+00	7.1e+00	PCI/GDRY	09/03/2002

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03829T	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	81.51 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: DRY POND - WEST EDGE OF CHANNEL

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54B	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	2.27e+01	1.4e+01	1.5e+01	PCI/GDRY	09/03/2002
Beta	1.79e+02	1.1e+01	6.5e+00	PCI/GDRY	09/03/2002

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SAMPLE ANALYSIS REPORT

Sample #:	A2.03830K	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	87.07 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: DRY POND - HOT PARTICLE

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54C	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.74e+01	1.3e+01	1.2e+01	PCI/GDRY	09/03/2002
Beta	3.61e+01	6.2e+00	7.0e+00	PCI/GDRY	09/03/2002

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

SAMPLE ANALYSIS REPORT

Sample #:	A2.03831L	QC batch #:	0002566K
Matrix:	SOIL	Prep batch #:	0007075B
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 GDRY	Analysis procedure:	NAREL GR-03
Dry/wet weight:	89.43 %	Analyst:	EFG
Ash/dry weight:	N/A	QC type:	ANA

Comment: RAILROAD - OLD SIDING

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/03/2002 20:04	100.0	G54D	MHW

ANALYTICAL RESULTS

Analyte	Activity	± 2σ Uncertainty	MDC	Unit	Date
Alpha	1.04e+01	1.0e+01	6.1e+00	PCI/GDRY	09/03/2002
Beta	2.02e+01	5.2e+00	6.5e+00	PCI/GDRY	09/03/2002

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
ALPBET ANALYSES
SDG #0200036

QC BATCH SUMMARY

QC batch #: 0002566K
Preparation procedure: N/A
Analysis procedure: NAREL GR-03

NAREL Sample #	QC Type	Yield (%)	± 2σ Uncertainty (%)	Analyst
A2.03821J		N/A		EFG
A2.03822K		N/A		EFG
A2.03823L		N/A		EFG
A2.03824M		N/A		EFG
A2.03825N		N/A		EFG
A2.03825N	DUP	N/A		EFG
A2.03826P		N/A		EFG
A2.03827Q		N/A		EFG
A2.03828R		N/A		EFG
A2.03829T		N/A		EFG
A2.03830K		N/A		EFG
A2.03831L		N/A		EFG

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0002566K Analytical Procedure: NAREL GR-03

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 2σ	RPD	Z
A2.03825N	ALPHA	2.81e+01 ± 1.5e+01	2.73e+01 ± 1.4e+01	3.22	-0.09 OK
A2.03825N	BETA	4.73e+01 ± 6.7e+00	5.78e+01 ± 6.8e+00	20.05	1.74 OK

Analyst: Eunice F. Gatlin 9/11/02
Gatlin, Eunice F.

QA Officer: Kurt O McElvaine 9/12/02